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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002950581 for a patent by WAYNE CALLEN as filed on 02 August 2002.

WITNESS my hand this
Thirteenth day of August 2003

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AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:-

"ELECTRICAL SAFETY CIRCUIT"

The invention is described in the following statement:-

This invention relates to an electrical safety circuit and has been devised particularly though not solely for the isolation of power supply to a mains voltage appliance in the presence of water.

There are many situations in which it is desirable for the safety of the operator of a mains voltage electrical appliance (typically at 240 volts AC or similar), that an electrical safety circuit is provided which will very quickly interrupt the supply of current to the appliance when water is detected in the appliance, and in particular when the appliance is immersed in water.

The classical situation to demonstrate this need is that of a hair dryer being dropped in a bath full of water, which in the past has had potentially lethal consequences for anybody wholly or partially immersed in the bath full of water. Although various safety devices such as circuit breakers and earth leakage detectors (safety switches) are well known, none are effective in this situation to interrupt the supply of power to the appliance which has been rendered unsafe by the presence of water, and particularly by being immersed in water.

Accordingly, the present invention provides an electrical supply circuit arranged to interrupt the supply of mains voltage power to a load, said circuit including a relay actuable by a low voltage DC current in the load, created when the load is immersed in water, and a switch in the mains voltage supply to the load, opened by the relay upon actuation.

Preferably the switch in the mains voltage supply is arranged to open one of neutral and active supply lines of mains voltage power, and the circuit further includes a mains voltage relay operable upon opening said switch to directly or indirectly open a switch in the other of the neutral and active supply lines.

Throughout this specification the term "mains voltage power" is intended to refer to what is typically an AC power supply at a voltage used for domestic or light industrial appliances, typically 240 volts AC or 400 volts AC in Australia with variations in other countries such as 110 volts AC in the USA. The term "low voltage DC current" refers to a voltage which is typically 12 volts DC but may well cover a range such as 3 volts DC up to 50 volts DC.

The invention comes from a realisation by the inventor that when a resistive load, such as that commonly found in a heating element in a hair dryer, or in an electric motor, is immersed in water, the mains voltage AC current in the load is rectified to DC between the active and neutral supply lines, building up to a voltage of between 6 and 12 volts. The inventor has realised that this build up of DC current in the water immersed load, can be used to actuate a low voltage DC relay which in turn is used to immediately interrupt the mains voltage power supply to the appliance, rendering the appliance safe.

Notwithstanding any other forms that may fall within its scope, one preferred form of the invention will now be described by way of example only with reference to the accompanying drawing which is a circuit diagram of an electrical safety circuit according to the invention.

In the preferred form of the invention an electrical appliance to be protected by the electrical safety circuit according to the invention is shown diagrammatically as a resistive load at 1 provided with mains voltage power between an active supply terminal 2 and a neutral supply terminal 3.

Mounted on, or incorporated integrally with the electrical appliance is the electrical safety circuit contained within a waterproof membrane or housing 4.

The safety circuit incorporates a metal plate sensor 5 having an air gap between the sensor and the resistive load 1, arranged so that the sensor 5 is adapted to detect low voltage DC current in the load 1.

The circuit further includes a low voltage DC relay coil 6 forming part of a low voltage DC relay (typically at 12 volts) which is arranged to open a switch 7 in the mains voltage neutral supply from terminal 3.

The neutral supply is in turn connected to the relay coil 8 of a 240 volt AC relay operable to open a normally closed switch 9 which in turn actuates relays in normally open mains voltage switch 10 and normally open low voltage DC switch 11, the operation of which in turn opens a further switch 12 in the mains voltage active supply from terminal 2.

Upon the resistive load 1 becoming wet e.g. by being immersed in water, the AC current in the load is rectified to DC and builds up to the region of 6 to 12 volts DC current. When the DC voltage reaches a certain value it is sufficient to provide power through the metal plate sensor 5 to the relay coil 6 which in turn immediately opens the mains voltage neutral line switch 7. The interruption of supply through switch 7 in turn causes relay 8 to act through the normally closed and normally open switches 9, 10 and 11 and open the switch 12 in the mains voltage active supply 2.

In this manner, as soon as a dangerous level of moisture, sufficient to rectify the current in load 1, is present, relay coil 6 is energised, causing the power supply to be immediately interrupted as described, and as shown in the accompanying drawing.

Although the electrical safety circuit has been particularly described in a situation where it is applicable for use with "at risk" appliances such as hair dryers, it will be appreciated that it could be applied to a wide range of appliances which are at risk in a moisture laden environment, or to other devices such as extension leads and other mains

voltage electrical loads or conductors which are at risk from immersion in water or in the presence of a moist environment.

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